

Interactive comment on “Extraterrestrial dust as a source of bioavailable Fe for the ocean productivity” by Rudraswami N. Gowda et al.

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Nice article with a unique insight into the importance of cosmic dust on the biosphere. Certainly appropriate for the journal. I post below some comments to consider, which I hope you find helpful:

Line 135 onwards: "The abundance of Fe within cometary porous particles is lower than in chondrites since it is diluted by abundant carbonaceous matter (>30%). The increase in average Fe owing to large OC particles is, therefore, offset by its lower content in small cometary grains. The parent body abundances amongst Indian Ocean cosmic spherules, therefore, give a good estimate for the average Fe abundance of the ET flux prior to atmospheric entry" - The authors argue that the Indian ocean MM

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collection is representative of the whole ET flux (in terms of Fe content) because the small Fe-poor particles (likely from comets) and the large Fe-rich particles (from ordinary chondrites) offset each other in terms of Fe contribution. But this seems a weak argument. Firstly, the Fe-poor cometary particles are not found in ocean collections, having not survived in the ocean medium and secondly it is possible that specific types of micrometeorites with distinct compositions do not survive atmospheric entry due to their speed/size/angle parameters. For example a distant cometary source which supplies particles to Earth with a unique composition but which do not survive entry due to their high entry velocities will only contribute Fe to the atmosphere and not to the oceans. I recommend this section is expanded and treated in more detail - you could consider meteor spectroscopic data to better constrain the composition of MMs that evaporate entirely.

If the contribution of extraterrestrial Fe to the oceans is large, as indicated in the study should we be able to see an isotopic signature from this contribution? Can the authors make any predictions that could be independently verified by isotopic analysis of dissolved Fe in ocean water?

We recently produced a new mass flux estimate for MMs and also reviewed previous MM mass flux calculations. (Suttle, M.D. and Folco, L., 2020. JGR, The Extraterrestrial Dust Flux: Size Distribution and Mass Contribution Estimates Inferred From the Transantarctic Mountains (TAM) Micrometeorite Collection). This study showed that distinct size distribution peaks exist within the micrometeorite flux, likely indicating different MM sources and that the flux appears unchanged over the Quaternary, it may be of use to you in this work (Section 3.2).

All the best,

MD Suttle